

1 **(April 5, 2004)**

2 ***Permanent Ground Anchor Materials and Components***

3 A permanent ground anchor system is a structural system used to transfer tensile loads
4 to soil or rock. A permanent ground anchor system may also be specified in the Plans
5 as an anchor, a ground anchor, or a tieback. A permanent ground anchor system
6 includes all prestressing steel, anchorage devices, grout, coatings, sheathings and
7 couplers if used.

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9 The Contractor shall either select a permanent ground anchor system from the Qualified
10 Products List or submit the following information to the Engineer for approval:

- 11
- 12 1. Catalogue cuts or Manufacturer's Certificates of Compliance for anchorage
13 covers, bond breaker, centralizers, corrosion inhibiting grease, end caps, grout
14 admixtures, and strand tendon spacers.
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16 2. Manufacturer's Certificates of Compliance for anchor heads, anchor head
17 wedges, bar tendon nuts, bar tendon couplers, tendon encapsulation tubing,
18 trumpet assemblies, and bar tendons or strand tendons. The Manufacturer's
19 Certificates of Compliance for the anchorhead wedges (grippers), and bar
20 tendon nuts and couplers, shall confirm compliance with the specified strength
21 requirements.
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23 If the Contractor selects a permanent ground anchor system from the Qualified
24 Products List (QPL), the Contractor shall submit, to the Engineer, a certificate from the
25 permanent ground anchor system fabricator/supplier confirming that the material
26 specifications of the permanent ground anchor system components as furnished
27 conform to those specified in the QPL submittal as approved by WSDOT.

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29 **Component Material Specifications**

30 Anchorage covers shall have a minimum thickness of five millimeters and shall
31 conform to either ASTM A 53 for pipe, or ASTM A 500 for tubing, or ASTM A 36M,
32 ASTM A 529M, ASTM A 572M, ASTM A 588M, or AASHTO M 270M for fabricated
33 steel.

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35 Anchorheads shall conform to either ASTM A 36M, AASHTO M 169 Grades 1040
36 or 1045, ASTM A 521 Grade 1045, ASTM A 576 Grade 1045, or ASTM A 536
37 Grade 80-55-06.

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39 Bearing plates shall conform to either ASTM A 36M, ASTM A 572M, ASTM A
40 588M, AASHTO M 270M, ASTM A 529M, or ASTM A 536.

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42 Anchorhead wedges (grippers) shall conform to AASHTO M 169 Grade 12L14,
43 case hardened 0.305 millimeters to 0.381 millimeters deep to Rockwell C 59 to 65.

44
45 Bar tendon nuts shall conform to either ASTM A 29M Grade C1045, ASTM A 521
46 Class CF, AASHTO M 169 Grades 1117 or 1144, or ASTM A 536 Grade 100-70-
47 03, and shall be capable of developing 100 percent of the GUTS of the bar tendon.

48
49 Bondbreaker shall conform to the requirements of Section 4.8 of the Post-
50 Tensioning Institute "Recommendations for Prestressed Rock and Soil Anchors",
51 Third Edition - 1996, and shall be fabricated from a smooth plastic tube or pipe
52 having the following properties:

1. Resistant to chemical attack from aggressive environments, grout or grease;
2. Resistant to aging by ultra-violet light;
3. Fabricated from material nondetrimental to the tendon;
4. Capable of withstanding abrasion, impact, and bending during handling and installation;
5. Enable the tendon to elongate during testing and stressing; and
6. Allow the tendon to remain unbonded after lock-off.

Centralizers shall be fabricated from plastic, steel, or material which is nondetrimental to the prestressing steel. Wood shall not be used.

Corrosion inhibiting grease shall conform to the requirements of Section 3.2.5 of the Post-Tensioning Institute, "Specification For Unbonded Single Strand Tendons".

Couplers for bar tendons, if required, shall be furnished by the manufacturer of the bar tendons and shall be AASHTO M 169 Grades 1045, 1117 or 1144, ASTM A 519 Grade 1026, or equivalent steel developing 100 percent of the GUTS of the bar tendon without evidence of any failure. Couplers shall be placed in the bond zone. Couplers for strand tendons will not be allowed.

End caps shall conform to ASTM D 3350 Class PE324420C or Class PE335400C, ASTM D 1248, and AASHTO M 252M, ASTM D 1784 Class 1346B, or ASTM A 36M.

Grout shall be a neat cement grout or a sand-cement grout. The compressive strength for the grout shall be as required by the tieback manufacturer and as approved by the Engineer. Grout components shall be as follows:

Admixtures shall conform to the requirements of Section 9-23.6. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations, trumpets and anchorage covers. Accelerators will not be permitted. Admixtures shall be compatible with prestressing steels and mixed in accordance with the manufacturer's recommendations.

Aggregates shall conform to the requirements of Section 9-03.

Cement shall conform to the requirements of Section 9-01, and shall not contain lumps or other indications of hydration.

Prestressing steel shall consist of either bar tendons with an ultimate tensile strength of 1,035 MPa conforming to AASHTO M 275M Type II, or strand tendons with an ultimate tensile strength of 1,860 MPa conforming to AASHTO M 203M. The Contractor shall submit certified mill test results and typical stress-strain curves along with samples from each heat, properly marked, for the prestressing steel to the Engineer. The typical stress-strain curve shall be obtained by approved standard practices. The guaranteed ultimate strength, yield strength, elongation, and composition shall be specified.

1 Strand tendon spacers shall be fabricated from plastic, steel, or material which is
2 nondetrimental to the prestressing steel. Wood shall not be used.

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4 Tendon encapsulation, when specified in the Plans to provide additional corrosion
5 protection, shall be fabricated from one of the following:
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- 7 1. High density corrugated polyethylene (PE) tubing conforming to the
8 requirements of ASTM D 3350 Class PE335520C or Class PE335400C,
9 ASTM D 1248, and AASHTO M 252M and having a nominal wall
10 thickness of 1,020 micrometers.
11
- 12 2. Corrugated, polyvinyl chloride (PVC) tubing conforming to ASTM D 1784,
13 Class 13464-B, and having a nominal wall thickness of 1,020
14 micrometers.
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16 Trumpet providing the transition from the bearing plate to the unbonded length
17 corrosion protection shall be fabricated from a steel pipe or tube conforming to the
18 requirements of ASTM A 53 for pipe or ASTM A 500 for tubing. The trumpet shall
19 have a minimum wall thickness of five millimeters, and shall be seal welded to the
20 bearing plate. The seal weld shall be visually inspected only, in accordance with
21 Section 6-03.3(25)A.